

Key

Mole ConversionsWhat is the mass of 8.67×10^{15} molecules of C_2H_6 ?

$$8.67 \times 10^{15} \text{ molecules} \left(\frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ molecules}} \right) \left(\frac{30 \text{ g}}{1 \text{ mole}} \right) = \boxed{4.32 \times 10^{-7} \text{ g}}$$

Density (STP conditions) = use $22.4 \text{ L} = 1 \text{ mole}$ What is the molar mass of a gas that has a density of 0.065 g/ml at STP?

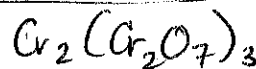
$$D = \frac{m}{V} \quad M = DV \quad \frac{0.065 \text{ g}}{\text{ml}} \left(\frac{1000 \text{ ml}}{1 \text{ L}} \right) \left(\frac{22.4 \text{ L}}{1 \text{ mole}} \right) = \boxed{1.5 \times 10^3 \text{ g/mole}}$$

Density (non-STP conditions) don't use $22.4 \text{ L} = 1 \text{ mole}$ The density of sulfuric acid is 1.85 g/cm^3 . How many oxygen atoms are there in 1.5 L of sulfuric acid? H_2SO_4

$$D = \frac{m}{V} \quad M = DV \quad \frac{1.85 \text{ g}}{\text{cm}^3} \left(\frac{1000 \text{ cm}^3}{1 \text{ L}} \right) \left(\frac{1.5 \text{ L}}{1} \right) \left(\frac{1 \text{ mole } H_2SO_4}{98.1 \text{ g}} \right) \left(\frac{6.02 \times 10^{23} \text{ molecules } H_2SO_4}{1 \text{ mole } H_2SO_4} \right) \left(\frac{4 \text{ atoms of O}}{1 \text{ molecule } H_2SO_4} \right) = \boxed{6.8 \times 10^{25} \text{ oxygen atoms}}$$

Percent Composition

What is the percent composition by mass of chromium in chromium III dichromate?



$$\frac{\text{mass of Cr}}{\text{mass of } Cr_2(Cr_2O_7)_3} \times 100 = \% \text{ Cr in } Cr_2(Cr_2O_7)_3 \quad \frac{(8 \times 52 \text{ g})}{(8 \times 52 \text{ g}) + (21 \times 16.0 \text{ g})} \times 100 = \boxed{55.3\%}$$

Determine the empirical formula of a compound with the following composition by mass:

60.0 % C, 12.0 % H and 28.0 % N.

If this compound has a molar mass of 300 g/mol , what is its molecular formula?

$$60.0 \text{ g} \left(\frac{1 \text{ mole C}}{12.0 \text{ g}} \right) = 5 \text{ mol C}$$

$$12.0 \text{ g} \left(\frac{1 \text{ mole H}}{1.0 \text{ g}} \right) = 12 \text{ mol H}$$

$$28.0 \text{ g} \left(\frac{1 \text{ mole N}}{14.0 \text{ g}} \right) = 2 \text{ mol N}$$

already
are in the lowest
whole number ratio.

$$\text{Empirical formula} = C_5H_{12}N_2 = 100 \text{ g}$$

$$\frac{300 \text{ g}}{100 \text{ g}} = 3$$

